

APPLICATION

The devices are designed for remote measurement and recording of one, two or three physical quantities of various ranges.

The input signal may be direct voltage or current or resistance change.

DESCRIPTION

Description of device frame:

Measuring and recording devices together with electronic parts are located on the frame and slid into the box. The frame can be slid out and it is connected with the board of the box by means of a connector.

It consists of the following functional blocks:

- Tilting recorder table
- One to three recording devices with linear motor, pen and servo amplifier
- Paper feed unit
- Mother board of printed circuit with connectors for connection of electronic circuits of individual measuring channels and for connection with the terminal board of the box
- One to three boards of electronic circuits of measuring channels
- One to three range units

All circuits of power supply are located on the terminal board of the box. The face of the box is covered with transparent door with a label.

The range units are accessible after removing the recording table and unscrewing the covering panel. The device has no cut-out fuse. It is protected against overload by an electronic circuit at each linear motor, which disconnects the motor in case of an overload, and by non-destructive thermally dependent limiter in the circuit of primary wiring of the supply transformer. Input signals from measuring places are processed in each channel with galvanic separation.

TECHNICAL DATA

The device is designed pursuant to ČSN EN 61010-1 as an electrical equipment of protection class I for application in mains with category of overvoltage in installation III and pollution grade 2.

The internal source for power supply of input signal circuit corresponds to ČSN EN 61010-1, Article 6.3.

Electric strength:

- of mains circuit against protective terminal
AC 2200 V
- of inlet circuit against mains circuit
AC 4000 V
- of inlet circuit against protective terminal
AC 500 V
- of signalling relay contact circuit against protective terminal
AC 2000 V
- of signalling relay contact circuit against mains circuit
AC 4000 V
- of signalling relay contact circuit against inlet circuits
AC 4000 V
- of one signalling relay contact circuit against contacts of other relays
AC 2200 V
- between disconnected contacts of the same signalling relay
AC 1000 V
- between inlet contacts of individual measuring places
AC 500 V

The device is only designed for being built-in.

Power supply:

- Type of power supply mains: 1 / N / PE AC 230 V, 50 Hz
- Tolerance of supply voltage: $\pm 10\%$
- Tolerance of mains frequency: 48 to 62 Hz
- Coefficient of upper harmonics: max. 10 %

Electric insulation resistance: min.20 M Ω

Power input: max. 15 VA

Ingress protection: pursuant to ČSN EN 60529:

Box with lid in design: (172 49x xx2) (tilting down):
IP 52

Box with lid in design (172 49x xx3) (tilting to side)
IP 54

Terminals IP 20

Weight: 4 kg

Applied materials:

- The box is made of metal sheet and is painted
- The door is made of an alloy casting with a glass inspection hole
- Type of terminals is specified in Figure 4

Record:

Type of record:

- Line, width of record: 100 mm
- Visible length of record: 80 mm (for rolled paper)
- Distance of pens on time axis: 2.5mm
- Movement of record paper: 0, 10, 20, 60, 120, 240, 600, 1200, 3600, 7200, 14400 mm / hour

With the external control signal "STOP" – i.e. by shortcut of terminals 53-54, it is possible to stop the paper feed in the remote way for the period of existence of that control signal.

When selecting the feed units of the recording paper "mm/hour" on the top DIP switchover, it is possible to increase speed of feed in the remote way by the control signal "FAST" - i.e. by shortcut of terminals 51-52, 60 × for the period of existence of that control signal.

As for design A1, A2, external pulses of the TTL level brought to the terminals 51-52 (positive voltage to 52) control feed of recording paper in lines:

For design A1:

50, 100, 200, 600, 1200 pulses per 1 mm of feed

For design A2:

200, 400, 800, 2400, 4800 pulses per 1 mm of feed

Maximum speed of paper feed is 2mm/s for design A1 and 0.5mm/s for design A2.

Length of the recording paper: rolled 16m
folded 8m

Accuracy class of the device related to time recording pursuant to ČSN IEC 258+A1, Article 2.1.4: 0.05

Informative service life of pen cartridge: line 100m or 3-month operation

Time required for disconnecting motor in case of overload: 1 to 3 s

Time required for re-connecting motor: 5 to 10 s

OPERATION CONDITIONS

Ambient temperature: 0 to 50 °C

Relative ambient humidity:

10 to 95 % with upper level of water content 28g H₂O/kg of dry air

Atmospheric pressure: 86 to 106 kPa

Vibrations:

Frequency range [Hz] 10 to 55
Drift amplitude [mm] 0.35

At a special request, we deliver a recorder, which complies with the conditions of seismic resistance on the acceleration level of 30m.s⁻² in the frequency range 1 to 33Hz.

Heating period: 20 minutes

Type of operation: continuous

Operation position: horizontal

METROLOGICAL DATA

Input signals:

1. Voltage DC

Maximum range: 0 to +/- 20 V

Minimum range: 0 to 5 mV

Start suppression: max. 200 % of measurement span

Overload of input signals: max. 5 x range

2. Current DC

Maximum range:	0 to 20 mA
Minimum range:	0 to 50 μ A
Start suppression:	max. 200 % of measurement span
Overload of input signals:	max. 5 x range

3. Resistance

Maximum range:	0 to 300 Ω
Minimum range:	0 to 10 Ω
Start suppression:	max. 500 % of measurement span

Input resistance pursuant to input signal:

For voltage:	to 100 mV inclusive ≥ 10 M Ω
	over 100 mV $\geq 1250 \Omega / 1$ V
For current:	to 1 mA voltage drop ≤ 50 mV
	over 1 mA inclusive voltage drop ≤ 100 mV

Limits of permitted basic error:

Limits of permitted basic error of display and record with adjusted range unit:

- $\pm 0.5\%$,
- $\pm 1\%$ for voltage ranges below 10mV and for resistance ranges below 20 Ω .

The basic error is related to nominal range of input signal.

Linearity error:	max. ± 0.2 %
Hysteresis:	max. 0.3 %
Repeatability:	max. 0.2 %
Dead sector:	max. 0.2 %
Long-term drift for 240 hours:	max. ± 0.4 %

Additional errors:

- In case of ambient temperature change per each 10 °C:
 - for input signal to 10 mV and 20 Ω inclusive: ± 0.3 %
 - for other input signals: ± 0.2 %
- within the whole operation range of supply voltage: ± 0.1 %
- within the whole operation range of vibrations: ± 0.5 %
- Impact of interfering signals: max. 0.5 %
 - for serial in case of interfering signal 1 x range, however max. 5 V and 50 Hz
 - for parallel in case of interfering signal 500 x range, however max. 10 V and 50 Hz

The impact of other influencing quantities in the operation field has no metrological importance.

Compensation of comparison ends of thermoelectric couples:

- Internal: accuracy: ± 0.5 °C and 0.2 % per each 10 °C of ambient air temperature
- External: related temperature: 0 °C, or 20 °C, or 50 °C, or 70 °C

In case external compensation is required, its value shall be specified. Compensation of individual ranges may be discretionary.

Changeover period of pen:

below 0.5 s / 100 mm

Signalling of exceeding limit values:

Number of adjustable limits: 4
 Adjustment range: 0 to 100%
 Outputs: 1 x switch-over contact of relay for each limit, of which relays 1, 2 are idle in case of exceeding the limit (connection of contacts 15-16, 25-26) and relays 3, 4 are active in case of exceeding the limit (connection of contacts 35-37, 45-47)

Assignment of limits to measuring places:	discretionary
Contact rating:	250V / 8A AC1 250V / 2A AC15

Contacts of signalling relays can be used either in the mains voltage circuits or in safe voltage circuits; always all relays of one recorder in the same category of circuits.

Values of surface paths correspond to ČSN 33 0420-1.

ELECTROMAGNETIC COMPATIBILITY (EMC)

Resistance to external magnetic and electric fields: max. 400 A/m

Resistance to fast transient phenomena: Level 4 pursuant to ČSN EN 61000-4-4, (it shall not apply to terminals 51 and 52 of design A1, A2)

Resistance to electrostatic discharges: level 4 pursuant to ČSN EN 61000-4-2

Resistance to short interruptions:

5 periods pursuant to ČSN EN 61000-4-11

Limit values of interfering voltage on mains terminals: class B pursuant to ČSN EN 55011

DESIGNATION**Data on product:**

- Trade mark (on frame)
- Made in CZECH REPUBLIC (on frame)
- Type (on frame)
- Manufacturing number (on frame)
- Type and size of supply voltage, max. power input (on frame)
- Ingress protection (on frame)
- Accuracy class
- Scale position
- Trial voltage
- Symbol for link to independent document
- CE mark

The scale, reading rule and range unit specify the range measurement (input signal) and, as the case may be, the type of the sensor.

On label in the front, additional text for the measurement range can be printed. The text may contain 22 characters including spaces.

DELIVERY

Coils of recorder motor are secured against movement during transport with a stop in the form of a paper insert.

Unless agreed otherwise with the customer, each delivery includes:

- Delivery note
- Products pursuant to the purchase order
- The following is delivered with each recorder
 - Resistor Rj 20 Ω for resistance of input signals
 - Reading rule for each range
 - 2 sets of recording pens ZP 410-430 pursuant to design
 - 2 pcs of connecting yokes
 - 8 pcs of rolls of recording paper RP120
 - Tray for folded paper
 - Key - for design of lid of door tilting to side (172 49x xx3)
 - Accompanying technical documentation in Czech in the following range:
 - Product quality and completeness certificate (it declares compliance with Technical conditions and also serves as the warranty certificate)
 - Installation, operation and maintenance manual

If it is established in the purchase contract or agreed otherwise, the following documentation can be also delivered with the product:

- EC Declaration of Conformity
- Other documents

RELIABILITY

Reliability on conditions pursuant to ČSN 18 0023:

Informative value of medium time between failures is 16 000 hours. Medium life is 5 years.

PACKING

Both the device and accessories are packed pursuant to controlled packing regulations.

The devices are delivered in a packing ensuring resistance to the impact of thermal effects pursuant to ČSN EN 60654-1 and mechanical effects pursuant to ČSN IEC 654-3.

TRANSPORT

The devices may be transported in the following climatic conditions:

- Ambient temperature: -25 to 60 °C
- Relative ambient humidity: 5 to 95 %, without condensation
- Atmospheric pressure: 86 to 106 kPa

The devices are delivered in a transport package ensuring protection to the following mechanical effects:

- Vibrations: frequency 10 to 55 Hz
drift / acceleration 0.35 mm / 49 m/s²
- Surges: pulse amplitude 98 m/s²
pulse time 16 ms

The devices may be stored on conditions complying with the set of combinations of classes IE 21 pursuant to ČSN EN 60721-3-2.

STORAGE

The devices may be stored for the period of 1 year from the dispatching in the following conditions:

- Ambient temperature: - 5 to 45 °C
- Relative ambient humidity: 5 to 95 %, with upper limit of water content 29g H₂O/kg of dry air, without condensation
- Atmospheric pressure: 86 to 106 kPa

The devices may be stored in conditions corresponding to the set of combinations of classes IE 11 pursuant to ČSN EN 60721-3-1.

The storage life is max. 12 months. Afterwards, inspection piece tests of the product shall be made.

PLACING AN ORDER

The purchase order shall specify

- Name
- Product number
- Required ranges - pursuant to Figure 1
- As for the label, the required text shall be specified pursuant to table in Figure 3, Number of measuring places * El. measuring range * Scale range * External temperature compensation * Text on label - T:
- Number of pieces

Purchase order example:

Line recorder	172 49x 302		3 pcs		
1	* 4 to 20mA	* 0 to 600 °C J		* T: BOILER 1	
2	*	* 0 to 100 °C Pt100		* T: TEMPERATURE	
3	* 0 to 20 mA	* 0 to 10m		* T: LEVEL	
Line recorder	172 497 702		2 pcs		
1	* 0 to 20mA	* 0 to 16 t/h	*	* T: BARREL 3	
2	*	* 0 to 1200 °C K	* EK 0°C	* T: OVEN	
3	*	* 0 to 40 °C Pt100	*	*	
Line recorder	172 497 503		5 pcs		
		*200 to 600 °C J		* EK 50 °C	* T: BATH
Line recorder	172 497 603		3 pcs		
1	* 0 to 10V	* 63 to 160mm	*	* T: LEVEL	
2	*	* 100 to 300 °C J	* EK 20°C	* T: HEATING	

TABLE OF DESIGNS

SPECIFICATIONS			ORDERING NUMBER					
			172	49	x	xx	x	xx
Design	cover colour	standard			7			
		for MESSMU (black)			0			
	without signalling	one-curve				10		
		two-curve				20		
		three-curve				30		
	with signalling	one-curve				50		
		two-curve				60		
		three-curve				70		
	lid	tilting down					2	
		opened to side with lock					3	
control of recording paper feed *)	external pulses						A1	
							A2	
seismic resistance *)							SEI	

Drawing of lids is provided in Figure 2.

*) Design only as a special option after an agreement with the manufacturer

Depending on the number of curves, the device can be equipped with one to three scales located below each other. The ranges of measurement are specified in the desired order of curves, 1st curve – blue – has the indicator on the lowest scale.

INSTALLATION AND CONNECTION

The device is connected to the panel by means of two connecting yokes pursuant to drawing in Figure 2.

Drawing of connecting terminal board is provided in Figure 4.

WARNING:

The device has no fuse of mains power supply and shall be secured with an external fuse pursuant to ČSN EN 60127-2.

Connection of input signals:

The sensors (input signal) are connected by means of two, three or four-core cable with total insulation resistance min. 6MΩ. Resistance value of the circuit of input voltage signal to 100mV may be max. 300Ω.

Connection of voltage or current input signals and thermoelectric couples shall be made pursuant to Figure 5.

With respect to two-wire connection of temperature resistance sensors pursuant to Figure 5, resistor Rj shall be adjusted to

the resistance value of sensor circuit (i.e. resistance of both wires including resistance of internal wiring of the sensor) and shall be connected between terminals 3 and 4. Maximum resistance value of the circuit may be 20Ω.

With respect to three-wire connection of temperature resistance sensors pursuant to Figure 5, resistor Rj shall be connected to terminal 4 and adjusted to the resistance value of internal wiring of the sensor. Resistance value of individual inlet wires to terminals 2 and 4 shall be equal and may be max. 20Ω. Resistance of wire to terminal 1 is not balanced.

In case of four-wire connection of the resistance temperature sensor with auxiliary loop pursuant to Figure 5, the resistance value of individual inlet wires shall be the same and may be max. 20Ω.

Three-wire connection of the resistance temperature sensor with auxiliary loop or resistance sensor in four-wire connection

shall be made pursuant to Figure 5. The resistance value of individual inlet wires shall be the same and may be max. 20Ω. Connection of the resistance transmitter shall be made pursuant to Figure 5. The resistance value of individual inlet wires shall be the same and may be max. 20Ω.

COMMISSIONING

The equipment may only be used in the way, for which it is designed by the manufacturer.

Basic handling:

Doors of the recorder in design (172 49x xx2) are opened by tilting down.

Doors in design (172 49x xx3) are opened after unlocking the lock to the side.

By pressing two levers on the sides of the recording table, it is released, turned to the front and removed. To use rolled recording paper, remove and store tray of folded paper. To use folded recording paper, remove and store unreeling and reeling coils.

The device is slid from the box after releasing the arrest screw by pressing the pawl located in the left bottom part and by simultaneous pulling by the fingerboard after releasing the screw in the middle of the fingerboard.

By pulling by the fingerboards, tilt the scale to the front. Insert the pen for the first range (blue) into the bottom holder and return the first scale (bottom) to the original position. In the same way slide the pen for the second range (red) and the third (green) range into the holders.

Note: The pens for the second and the third ranges are used pursuant to the design of the device. During each handling with pens, linear motors shall be at the right stop (use combination levers of the bottom DIP switchover to choose the switchover position "P").

Remove arrest of motors and store it for a possible further transport of the device.

The speed of feed of the recording paper is selected when the recording table is removed by a combination of levers of the top DIP switchover in the bottom part of the device (refer to Figure 6). Select the feed unit (mm/min. - mm/h) with the first bottom lever of this switchover. Visible period of record and operation period of one roll of rolled paper are specified in the following table:

Feed [mm/h]	Operation period	Visible period of record
10	66 days	8 h
20	33 days	4 h
60	11 days	80 min
120	5.5 days	0 min
240	66 h	20 min
600	26 h	8 min
1200	13 h	4 min
3600	260 min	80 s
7200	130 min	40 s
14400	66 min	20 s

In case of design A1, A2, connect the source of pulses of level TTL to terminals 51-52 (positive voltage to 52) and select the required number of pulses per 1mm of feed of the recording paper with the switchover on the bottom right part of the device.

Signalling set-up:

If the device is equipped with signalling that the limit is exceeded, assign individual limits 1 to 4 to the required measuring channels by means of the interconnecting field on the right side of the device at first. The assignment is made by means of shortcuts pursuant to Figure 6. The assignment can be combined arbitrarily.

The limits 1 and 2 are breaking; the relay is tripped to idle conditions when the pre-set value is exceeded. The limits 3 and 4 are switching; when the pre-set value is exceeded, the relay is switched. Figure 4 illustrates the contacts in idle positions (relay disconnected).

Switching value is adjusted after the connection of the device to supply voltage and its insertion into the box as specified below. To make the set-up, there are 4 potentiometers (figure 6) and DIP switchover; gradually select conditions 1 to 4, when the adjustment potentiometers set up the limits 1 to 4. The switching value is displayed by the position of the indicator and the pen of the applicable measuring channel. After the set-up

of switching limits, the DIP switchover is returned to the basic functional condition "M".

Inserting recording paper:

Inserting rolled recording paper:

Release the beginning of the roll. Insert the unreeling coil into the roll and press the roll with paper into the grooves in the rear top part of the table. Slide the paper under the brake bar and lead it over teeth of the transport cylinder under the transparent cut-off ruler and slide it over the bottom guide bar into the slot in the reeling coil. By turning the reeling coil, reel about two turns and the paper is tight.

Inserting folded recording paper:

Insert the recording paper into the tray in the rear top part of the table. Slide the paper under the brake bar and lead it over teeth of the transport cylinder under the transparent cut-off ruler and let it fall freely to the bottom tray.

Insert the recording table into the grooves in the front bottom part of slid-in device. By turning, it is removed to the original position secured with arrest levers.

Commission the device by sliding it into the box and connecting supply voltage. Combination levers of the bottom DIP switchover of function shall be set to the basic functional position "M".

Warning: When sliding the device from the box, power supply and input signals are disconnected. Terminals of current circuits are bridged with diodes; therefore, you do not need to interconnect them.

Tighten the arrest screw only when transporting the device or if the operation takes place in conditions with increased vibrations.

OPERATION AND MAINTENANCE

The condition of used-up recording paper is indicated by a red line about 1 to 2 m from the end of the roll.

When using rolled paper, slide out the rolling coil from the removed table by pulling it downwards. Remove the left face of the coil and hold the coil by the right face. By turning the rolled paper against the direction of reeling, the paper is released and can be removed. The empty reeling coil is returned back.

Folded paper is removed after tilting the tray of folded paper. Inserting new recording paper is made as specified above.

Recording pens are replaced when the device is on and the recording table is removed. Combination levers of bottom DIP switchover are switched over to the position "P" (pen replacement), in which the linear motors are at the right stop. By pulling by the fingerboard tilt the top scale and remove the pen for the third range (green). In the same way remove the pen for the second range (red) and the first (blue) range. Slide the new pens in the opposite order while returning the scales to the original position simultaneously.

Note: When switching the function switchover to the position P, the motor is disconnected.

When replacing the recording paper, we recommend removing dust from the device that is formed by rolling the recording paper.

The range units are replaced after removing the covering panel. Unscrew three connecting screws M 2.5 (two on the left side and one on the right side of the device) and the panel is slid up and to the front. The original range unit is removed from the connector and a new one is slid into its place. The panel shall be connected to the original place. For accurate adjustment, the range unit shall be fine adjusted by potentiometers MIN and MAX pursuant to designation on the panel.

Replacement of scale is performed after unscrewing two screws on the sides of the scale. The beginning of scale shall correspond to the beginning of the raster on the recording paper.

WARNING: Before sliding the device from the box, the device shall be disconnected from supply voltage.

SPARE PARTS

Recording pens:

- For first measured place (blue) 1R - 459360
- For second measured place (red) 1R - 459393
- For third measured place (green) 1R - 459415

Recording paper (rolled):

It is delivered with designation RP 120

THE PURCHASE ORDER SHALL SPECIFY:

- Name

- Designation
- Number of pieces

PURCHASE ORDER EXAMPLE:

The recording paper RP 120 4 pcs

Range unit:

It is delivered by the manufacturer: The measurement range is entered by the beginning and the end of the range for the input signal. In case of direct connection of thermocouples and resistance thermometers to the recorder, the range of measurement of range units is entered by specification of the beginning and end temperatures, type of sensor and value of related temperature in case of application of thermocouples with external compensation of comparison ends.

THE PURCHASE ORDER SHALL SPECIFY:

- Name
- Product number 039 498 815
- Required ranges - pursuant to Figure 1
- Number of pieces

PURCHASE ORDER EXAMPLE:

Range unit: 039 498 815 4 to 20 mA 1 pc

Range unit 039 498 815 4 to 20 mA 1 pc

Range unit 039 498 815 0 to 20 mA 1 pc

Label:

It is delivered pursuant to the drawing and ordering number refer to Figure 3

THE PURCHASE ORDER SHALL SPECIFY:

- Name
- Product number
- Required text may be specified for the label pursuant to table in Figure 3 - Operation and maintenance manual.
- Number of pieces

PURCHASE ORDER EXAMPLE:

Label 030 192 815 1 pc

Text: 1 BOILER 1

2 TEMPERATURE

3 LEVEL

Scale:

It is delivered pursuant to the drawing and ordering number in Figure 3

A reading rule is delivered with the scale.

THE PURCHASE ORDER SHALL SPECIFY:

- Name
- Product number
- Required ranges - pursuant to Figure 1
- Number of pieces

PURCHASE ORDER EXAMPLE:

Scale 030 072 915 0 to 600°C J 1 pc

Scale 030 072 915 0 to 100 °C Pt100 1 pc

Scale 030 072 915 0 to 10m 1 pc

REPAIRS

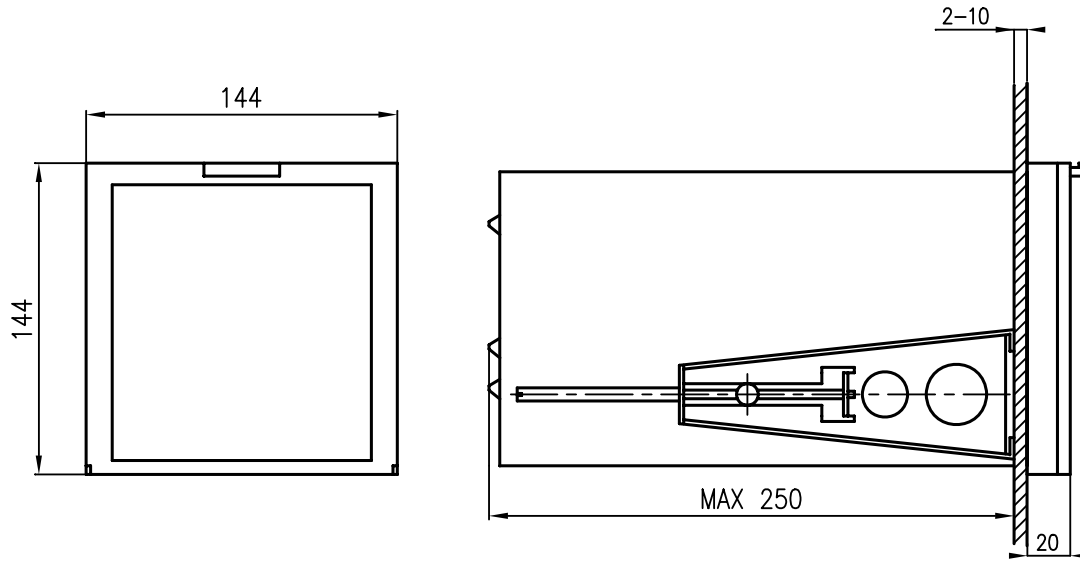
The devices shall be repaired by the manufacturer. The devices shall be sent for repair in the original packing without accessories.

Figure 1 Selection of recommended ranges of recorder

THERMOCOUPLE	RESISTANCE	CURRENT AND VOLTAGE
	Resistance thermometers	
0 to 200°C J	-25 to +25° Pt100	0 to 5 mV
0 to 300°C J	0 to +40° Pt100	0 to 10 mV
0 to 400°C J	0 to +50° Pt100	0 to 20 mV
0 to 600°C J	0 to +60° Pt100	0 to 30 mV
0 to 800°C J	0 to +100° Pt100	0 to 40 mV
0 to 900°C J	0 to +150° Pt100	0 to 50 mV
0 to 600°C K	0 to +200° Pt100	0 to 60 mV
0 to 900°C K	0 to +250° Pt100	0 to 80 mV
0 to 1200°C K	0 to +400° Pt100	0 to 100 mV
0 to 1200°C S	0 to +600° Pt100	1 to 5 mV
0 to 1400°C S	0 to 800° Pt100	2 to 10 mV
0 to 1600°C S	15 to +40° Pt100	4 to 20 mV
0 to 100°C J	50 to +100° Pt100	6 to 30 mV
0 to 150°C J	50 to +150° Pt100	8 to 40 mV
0 to 800°C K	100 to +100° Pt100	10 to 50 mV
0 to 1000°C K	100 to +300° Pt100	12 to 60 mV
0 to 1000°C S	100 to +400° Pt100	16 to 80 mV
100 to 300°C J	200 to +600° Pt100	20 to 100 mV
200 to 400°C J	400 to +600° Pt100	-5 to +5 V
200 to 600°C J	400 to +800° Pt100	-10 to 10 V
300 to 600°C J	-200 to -100° Pt100	-20 to +20 V
400 to 800°C J	-100 to +50° Pt100	0 to 1 V
300 to 600°C K	-60 to +80° Pt100	0 to 5 V
300 to 1200°C K	-50 to 0° Pt100	0 to 10 V
400 to 800°C K	-30 to +50° Pt100	0 to 20 V
600 to 1200°C K	--25 to 0° Pt100	1 to 5 V
600 to 1600°C S	0 to +25° Pt100	2 to 10 V
100 to 200°C J	0 to +80° Pt100	4 to 20 V
100 to 400°C J	0 to +500° Pt100	0 to 5 mA
150 to 350°C J	0 to +550° Pt100	0 to 10 mA
150 to 450°C J	0 to +300° Pt100	0 to 20 mA
200 to 500°C J	200 to +400° Pt100	1 to 5 mA
250 to 450°C J	300 to +550° Pt100	2 to 10 mA
400 to 600°C J	300 to +650° Pt100	4 to 20 mA
500 to 800°C J	500 to +800° Pt100	0 to 1 mA
200 to 600°C K	0 to +60° Ni100	0 to 2 mA
300 to 900°C K	0 to +100° Ni100	-1 to +1 mA
400 to 1200°C K		-2 to +2 mA
500 to 1000°C K		-10 to +10 µA
600 to 1000°C K		-20 to +20 µA
800 to 1200°C K		-50 to +50 µA
600 to 1200°C S		-100 to 100 µA
700 to 1300°C S	Resistance transmitter	-200 to 200 µA
800 to 1400°C S	100Ω	-500 to 500 µA
800 to 1600°C S		0 to +20 µA
1000 to 1600°C S		0 to +50 µA
0 to 200°C Fe-ko		0 to 100 µA
0 to 300°C Fe-ko		0 to +200 µA
0 to 400°C Fe-ko		0 to +500 µA
0 to 600°C Fe-ko		4 to 20 µA
0 to 800°C Fe-ko		10 to 50 µA
200 to 400°C Fe-ko		20 to 100 µA
300 to 600°C Fe-ko		100 to 500 µA
400 to 800°C Fe-ko		0.2 to 1 mA
300 to 1600°C B	*) Compensation of comparison ends is not performed	

Figure 2 Dimensional drawings of recorder

Design of lid that is tilting down (172 49x xx2)



Design of lid that is opened to side with lock (172 49x xx3)

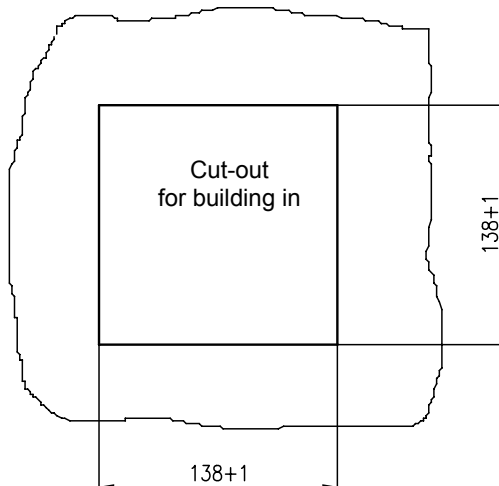
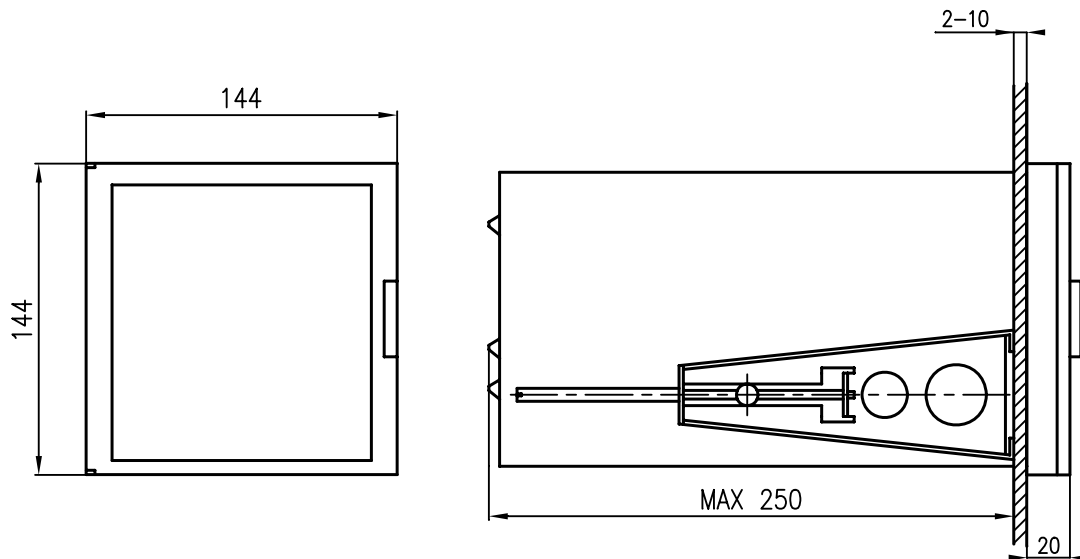
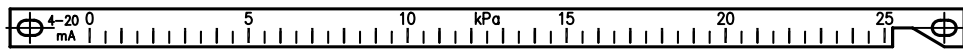


Figure 3 Drawing of scale and drawings of labels, specifications of measuring ranges

Spare part number
(ordering number)

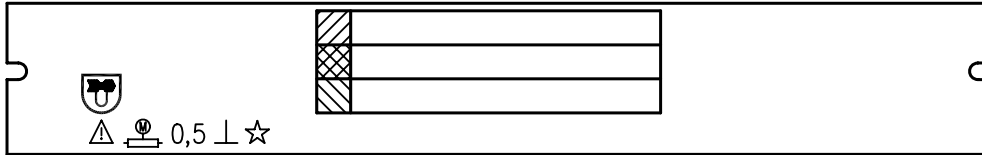
030 072 915

Scale



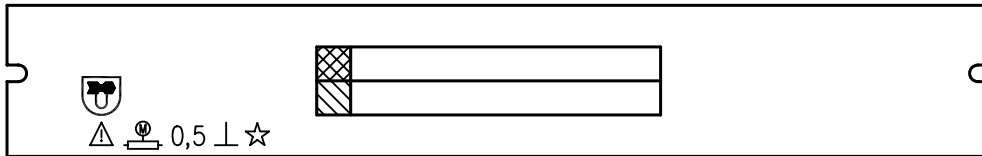
030 192 815

Label for three-curve design



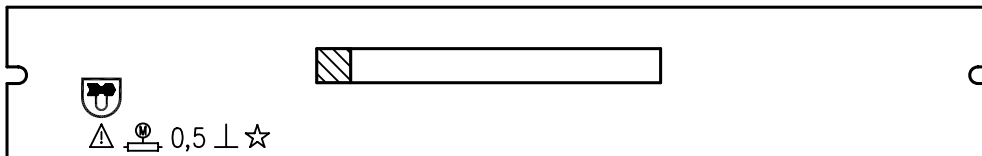
030 191 715

Label for two-curve design






030 190 615

Label for one-curve design



Colour of squares:

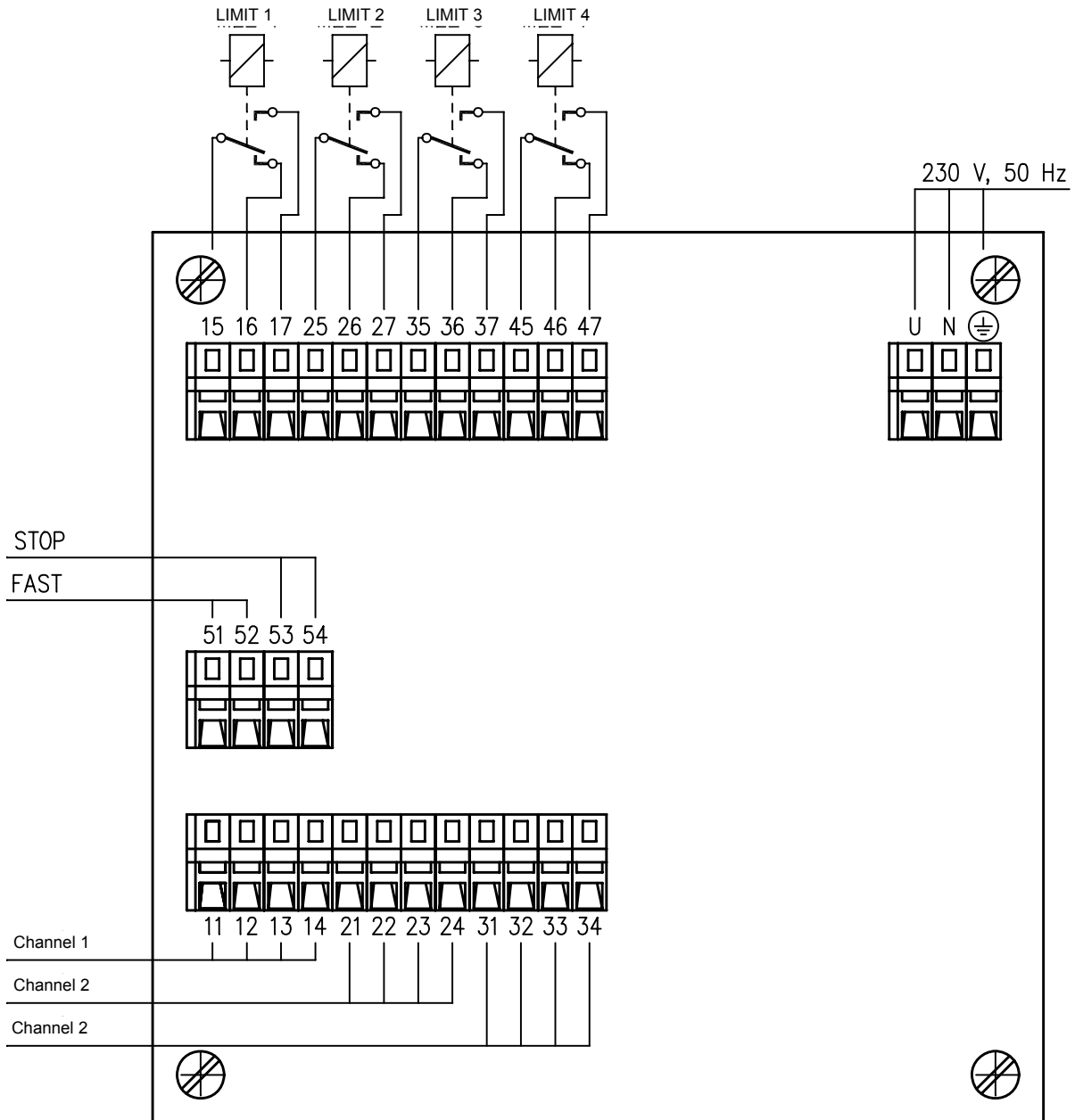
	green	3 rd measuring place
	red	2 nd measuring place
	blue	1 st measuring place

Specifications of measuring ranges (pursuant to the following table):

Measuring place number * El. measuring range * Scale range * External temperature compensation *
Text on label -T:

MEASURING PLACE NUMBER [x]	It specifies the number of the measure place; this number is not specified for one-curve design.
ELECTRICAL MEASURING RANGE [xxx...xxx]	The beginning and the end of the range for input signal shall be entered. Recommended ranges are in Figure 1. In case of direct connection of thermocouples and resistance thermometers to the recorder, the electrical measuring range is not specified because values of signals of these sensors are defined by applicable standards.
SCALE RANGE [xxx...xxx]	The beginning and the end of the range on the scale are entered as well as unit of measured quantity – it will be specified on the scale. Recommended ranges are provided in Figure 1. When using thermoelectric or resistance thermometers, the type of sensor shall be specified, which defines the course of scale and, in case of direct connection of such sensors to the recorder, it determines the corresponding electrical measuring range. Unless the type of the sensor is identified, the scale will be delivered with linear division.
EXTERNAL TEMPERATURE COMPENSATION [EK xx °C]	Temperature compensation is performed in case of direct connection of thermocouples to recorders; however only in case of using external temperature compensation of comparison ends when the value of related temperature of such compensation is added behind "EK". Unless the data "EK" is identified in the specification, the device will be delivered with internal compensation of comparison ends in the applicable measuring place.
TEXT ON LABEL T [xxx...xxx]	Specify the text of the required inscription on the corresponding label located in the bottom part of front door. The text may include max. 22 characters including spaces.

Figure 4 Drawing of terminal board

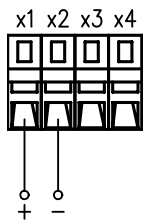


Type of terminals:
 Screw-less WAGO 236 for cross-section of wires 0.14 to 2.5mm².
 To connect them, use a screwdriver 3.5 × 0.5mm.

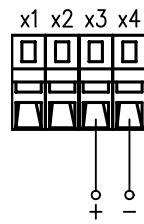
Note:
 Installation of terminals CHANNEL 2, CHANNEL 3, STOP, FAST and terminals LIMIT 1 - LIMIT 4 pursuant to design.

Figure 5 Connection scheme of input signals

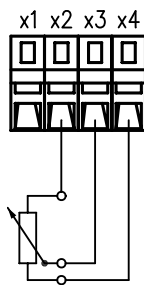
Voltage signals and thermoelectric couples



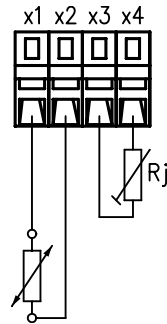
Current signals



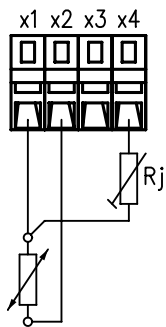
Connection of resistance transmitter



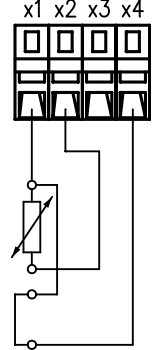
Two-wire connection of resistance temperature sensor



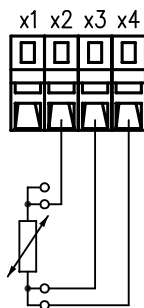
Three-wire connection of resistance temperature sensor



Three-wire connection of resistance temperature sensor with auxiliary loop



Three-wire connection of resistance temperature sensor in four-wire design



Four-wire connection of temperature resistance sensor with auxiliary loop

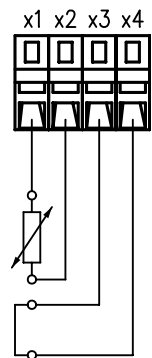
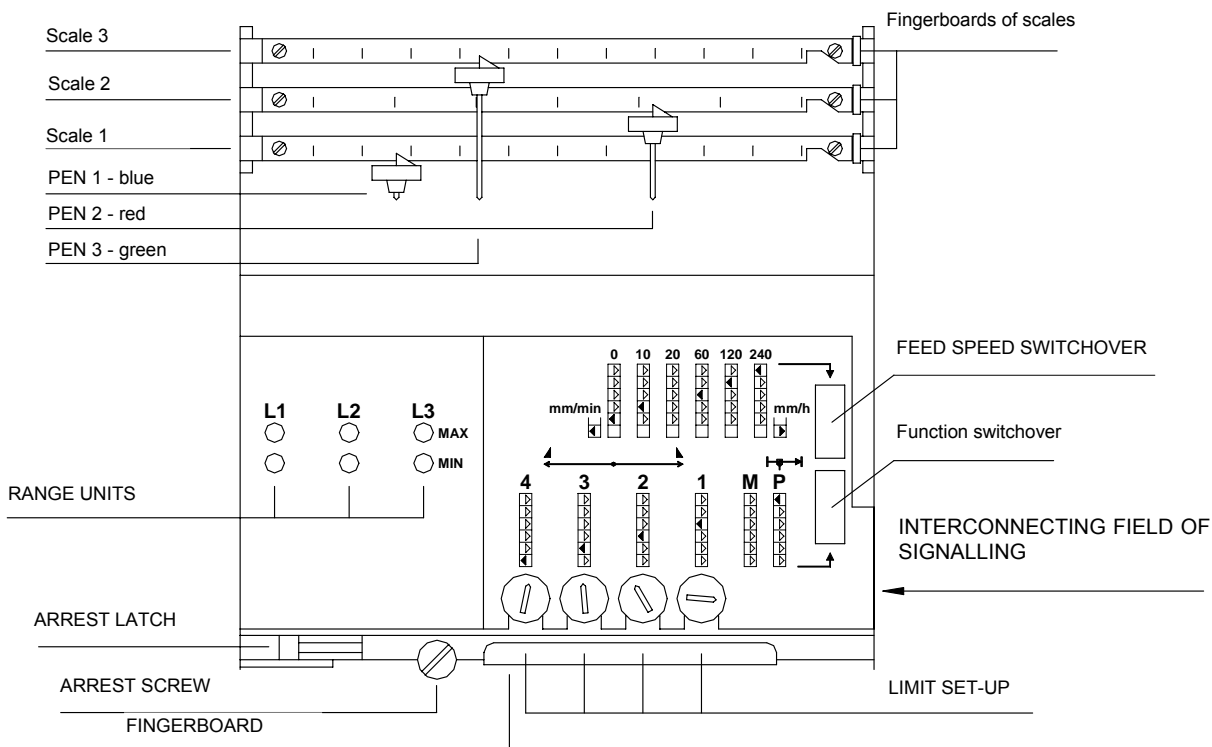
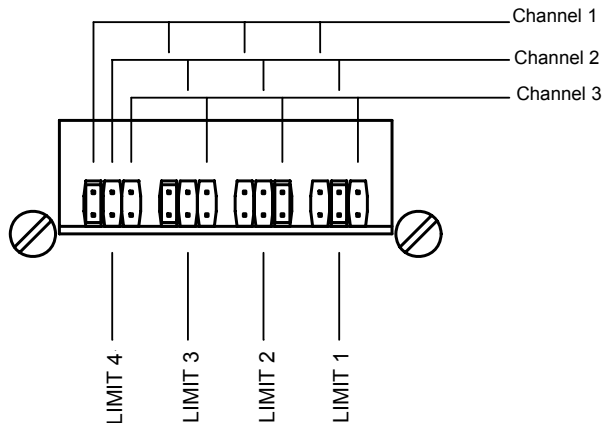


Figure 6 Drawing of design and interconnecting field of signalling



Interconnecting field of signalling



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